

# Applying Research in Forestry



Forestry Division

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## Black Walnut Curculio: Biology and Impact on Plantation-Grown Walnuts

Emphasis on nut production in managed black walnut plantations has increased in recent years. Markets currently exist for all black walnuts harvested, but supply often does not meet demand. At present, the majority of harvested black walnuts are from wild trees. The number of black walnut plantations in the Midwest has increased in recent years and the proportion of nuts harvested from managed plantations is expected to rise in the future. Plantation-grown nuts can have a higher value than nuts from wild trees. Nuts collected from native trees range in value from \$3.00 to \$9.00 per hundred pound weight (cwt). Because of the differences in percent crackability, prices as high as \$24.00 per cwt have been paid for plantation-grown nuts.

Black walnut is a source of food and shelter for several species of insects that utilize its nutrient rich nuts. Information on the impact of insects on black walnut nut production is limited. A few species are known to develop within the nut: the walnut husk fly, the walnut husk maggot and the black walnut curculio. Of these, the latter is thought to have the greatest impact on nut production.

The black walnut curculio is a member of a group of beetles known as weevils or snout beetles because of an

elongated "snout" on which the mouthparts are located. Many weevils feed on fruits, acorns or nuts. The black walnut curculio is known to feed on and develop within immature black walnut nuts, disrupting their normal development and causing a premature nut drop known as June nut drop.

The curculio spends the winter as an adult in the soil or beneath the organic litter that covers the soil. In Missouri, adults emerge from overwintering sites in mid-April and feed on the succulent foliage and staminate (male) flowers of black walnut. Oviposition on developing nuts begins shortly after fertilization of pistillate (female) flowers and continues into June. Eggs are placed into crescent-shaped wounds chewed into the husk of the developing nut.

The larva hatches within the nut about five days after egg deposition and feeds within the nut. Infested nuts drop from the tree about three weeks after oviposition. The larva remains within the nut for about two more weeks before entering the soil to pupate. Newly formed adult curculios emerge from the soil about three weeks after pupation occurs, usually from mid-July through August. These adults feed on black walnut foliage until leaf drop begins, then move to the ground to overwinter.

Data on nut survival and black walnut curculio damage have been collected annually on the Sho-Neff black walnut plantation near Stockton, Missouri since 1985. The objectives of this project are to

***The black walnut curculio is an insect that causes nuts to drop prior to adequate ripening. Each year varying amounts of nut drop can be caused by the curculio. In the 5 years since this study began, 2-32% of the nut drop could be attributed to the curculio. An economic evaluation indicates that at higher levels, monetary gains would be significantly reduced.***

1) describe the temporal pattern of nut loss from pistillate flower formation through nut maturity and 2) estimate overall nut mortality and the contribution of the black walnut curculio to nut mortality.

Randomly selected nut clusters were observed from pistillate flower formation in May through nut maturity in September. The number of nuts present in each cluster was recorded during each sampling period. The occurrence of black walnut curculio oviposition was also noted. Trees used in the study were planted in the spring of 1975 and 1976.

## Results

Three periods of nut mortality occur during the growing season (Fig. 1). About 50% of the potential nut crop is lost each year because of pistillate flower abscission. The cause of this loss is unknown, but inefficient pollination may be involved. A similar mortality pattern has been reported in pecans and in English walnut. A period of moderate nut loss, caused primarily by black walnut curculio oviposition, occurs from late May through June. Little nut mortality occurs during the final week of the nut maturation process.

Since 1987, nut loss has ranged from 47 to 93%. These values represent losses attributed to pistillate flower abortion, curculio induced nut drop, and other causes. During the same period, annual nut loss caused by black walnut curculio oviposition and larval development has ranged from 2 to 32% (Fig. 2). These losses have increased in recent years and may correlate to an increasing curculio population in response to increased nut production as trees within the plantation mature and carry more fruit.

## Recommendations

A recent economic analysis of black walnut curculio impact was conducted with Dr. William Kurtz, The School of Natural Resources, University of Missouri. The significance of curculio caused nut mortality is easily demonstrated through computation of the present value of losses. The values of losses in present

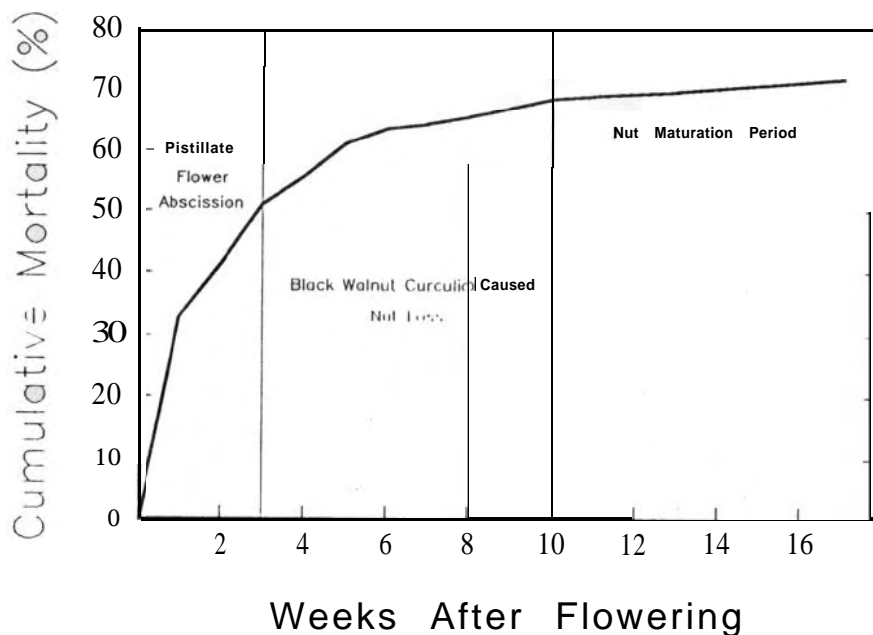


Fig. 1. Three periods of nut mortality are observed: pistillate flower abscission, nut drop due to curculio activity and a period of low mortality during the final weeks of nut maturation.

dollars at the beginning of nut production range from \$10.59 to \$552.20 per acre (5% discount rate). These values can be interpreted as an initial deficit for a producer with nut mortality in these ranges at the beginning of production.

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This analysis is not intended for use as a pest management decision making tool, but rather as an initial economic evaluation of curculio impact on nut production in the plantation environment. Future data may indicate that a pest management program might be necessary to minimize damage by the black walnut curculio.

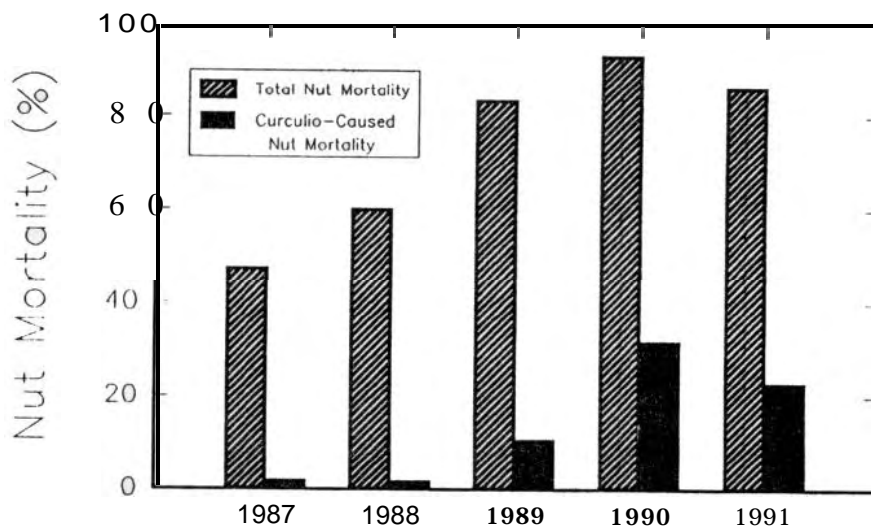


Fig. 2. Total nut mortality and black walnut curculio caused nut mortality.